

REMARKS

This application is a continuation application of U.S. Patent Application Serial No. 09/141,775, filed August 27, 1998. Claims 8, 9, 14, 15, 29, 43, 51 and 52 have been canceled without prejudice. Claims 1-7, 10-13, 16-28, 30-42, 44-50 and 53-57 are pending herein.

In an Office Action mailed August 25, 2000, Claims 1-7, 10-13, 16-28, 30-42, 44-50 and 53-57 were rejected under 35 U.S.C. §103(a) as being unpatentable under various combinations of Keller (U.S. Patent No. 5,644,153), Xia et al. (U.S. Patent No. 5,935,340, hereinafter "Xia") and Saito et al. (U.S. Patent No. 5,681,424, hereinafter "Saito").

The Examiner alleged that the plasma etching method disclosed by Keller encompass plasma etching a semiconductor wafer with a plasma etching material where a polymer of carbon and halogen are formed over an etching chamber's internal surfaces. The Examiner further alleged that the method of Keller also disclosed plasma etching with a gas effective to etch/clean the polymer formed on the chamber's surfaces, although such effective gas does not disclose that a gaseous hydrogen halide product of such etch/clean is formed. Rather the Examiner alleges that Xia disclosed such an effective gas, specifically at column 59, lines 47-50 and alleged further, that one skilled in the art would have found it obvious to use Keller's gas having a hydrogen component to form a hydrogen halide in view of Xia. Applicant DISAGREES.

1 As the Examiner admitted on page 3, line 2 of the
2 above-referenced Office Action, Keller's gas having a hydrogen component
3 is HBr, a gas containing both hydrogen and a halogen, specifically
4 bromine. Hence Applicant respectfully asserts that such a gas cannot be
5 effective by itself to remove a halogen from the polymer as the
6 stoichiometry of HBr dictates that for each hydrogen introduced, a
7 halogen is introduced, therefore there can be NO net removal of halogen
8 using such a gas. Rather, if such a gas were to react with a halogen
9 contained within a polymer, at best the halogen of the polymer would
10 only be exchanged for the bromine of the HBr.

11 In addition, Applicant notes that the process disclosed by Xia is
12 not a plasma etching process as described by Keller. Rather Xia
13 discloses a method for HIGH TEMPERATURE PROCESSING.
14 Specifically, the process disclosed at the portion of Xia referred to by
15 the Examiner is performed at a preferred temperature range of 550 to
16 600°C, a temperature at which the wafers being processed by Keller are
17 likely to be damaged due to the decomposition of the photoresist Keller
18 teaches is used as an etch mask. Hence, Applicant asserts that a
19 combination of Keller and Xia would NOT be obvious, as a skilled
20 practitioner of the etching arts would know that (1) HBr would not be
21 expected to cause any net reduction in halogen content as it introduces
22 as much halogen as it can remove, and (2) the high temperature process
23

1 of Xia cannot be combined with the etching process of Keller as such
2 would, at the very least, severely damage the photoresist masking layer.

3 The Examiner also refers, in the rejection of some claims, to Saito.
4 Specifically the Examiner alleges that Saito discloses the use of oxygen,
5 not disclosed in either of Keller or Xia. The Examiner then alleges that
6 it would have been obvious for one skilled in the art to combine the
7 oxygen disclosed by Saito with the method resulting from the
8 combination of Keller and Xia. Applicant DISAGREES. Keller
9 specifically teaches that the two step process disclosed is to provide
10 improved critical dimension control of the etched material. Keller
11 provides such improved control by providing a second etching step which
12 functions "to remove non-uniformities that remain after the primary etch"
13 (col. 4, lines 41-42). The second etching step has a lower etch rate,
14 with respect to the silicon nitride being etched, than the first etching
15 step (id., lines 48-49) and additionally removes most of the polymer
16 formed on the sidewalls of the etched structure during the first etching
17 step (id. lines 56-57). However, as oxygen introduced into a plasma
18 etching chamber is well known as a method for removing photoresist,
19 Applicant asserts that such an introduction in the second etching step
20 of Keller would, at the very least, remove some of the photoresist mask
21 and thus cause such second etching step to alter the critical dimension
22 of the structure formed by the etching of the first step. It is also well
23 known that the rate of such photoresist removal is enhanced by high

1 temperatures so that it is likely that the high temperatures taught by Xia
2 would dramatically increase such a removal rate. Thus, Applicant asserts
3 that rather than a combination that would be obvious to a skilled
4 practitioner, the Examiner's proposed combination would prevent the
5 method of Keller from achieving the result to which it is directed.

6 In summary, Applicant presents Claims 1-7, 10-13, 16-28, 30-42,
7 44-50 and 53-57 for consideration in this Continuation Application.
8 Additionally, Applicant respectfully asserts that in view of the remarks
9 presented above, a rejection of such claims based on ANY combination
10 of Keller, Xia and Saito is inappropriate as such combinations cannot be
11 suggested where they prevent the result sought by any one of the
12 references cited. Such has been shown above. Applicant therefore
13 asserts that such claims are in condition for allowance as presented,
14 which action is earnestly sought.

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16 Respectfully submitted,

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